

93 110. (Amended) A microwave plasma processing method according to claim 109, wherein adjacent slots of said plurality of slots are at a spacing of one half or one quarter of a guide wavelength of microwaves in said annular waveguide.

REMARKS

The claims are claims 1-110 with claims 1, 10, 19, 26, 38, 50, 60, 68, 78, and 86 being independent. Claims 68 and 78 have been amended to correct minor informalities that do not affect patentability, and claim 110 has been amended to properly depend from claim 109. No new matter has been added and reconsideration of the claims is expressly requested.

Applicants have enclosed herewith, an executed supplemental reissue declaration and power of attorney. To complete the record, Applicants will shortly file the executed Statement Under 37 C.F.R. §3.73 (b) and the original Letters Patent. Applicants respectfully request that the requirements for these documents be held in abeyance for a short time until they can be filed.

Applicants also have enclosed herewith, a substitute specification in which the Certificate of Correction changes have been inserted, without bracketing or underlining, as required by the Examiner. The enclosed substitute specification also includes four minor corrections shown on the attached marked up copy (Page 14, line 6; Page 16, line 31; Page 26, line 14; and Page 41, line 2). Applicants note that a substitute specification is not ordinarily permitted in a reissue application (37 C.F.R. §1.125(d)). However, Applicants are submitting the substitute specification at the specific request of the Examiner. The undersigned certifies that no new matter has been added. Applicants

respectfully request that claims 1-18 and 26-49 be deemed allowable based upon the enclosed supplemental reissue declaration.

Applicants have amended claims 68, 78, 110 as suggested by the Examiner to obviate the claim objections.

The specification has been amended to correct a typographical error. No new matter has been added.

Turning to the substantive rejections, the Examiner has rejected claims 19-25 and 50-110 under 35 U.S.C. §103 as obvious over Suzuki, JP 7-90591 in view of Inoue, JP 5-62796 and Watanabe et al JP-263186. The Examiner has also rejected claim 110 on the basis of statutory type double patenting under 35 U.S.C. §101. Applicants respectfully traverse the grounds of rejection.

Applicants would like to review certain key features and advantages of the present invention. The present invention is directed to a microwave plasma processing apparatus and a plasma generating mechanism in which a slotted annular wave guide tube is filled with a first and a second dielectric material which varies the guide wavelength. The use of a second dielectric material permits a reduced interval between the slots. The plurality of slots in the waveguide tube decrease the size of the guide wavelength, such that the interval between the slots can be made smaller which in turn increases the slot density. This feature permits a higher density and more uniform plasma to be generated a higher speed and at a lower temperature.

The unexpectedly superior results of the present invention rebut any possible presumption of obviousness and are illustrated in Embodiments 5 and 8 found on substitute specification pages 22 and 26, respectively. In Embodiment 5, a first and second dielectric material are used. The annular wave guide tube employed in the present

embodiment had 56 slots formed an interval of about 20 mm. (See Substitute Specification Page 23, lines 10-12). In comparison with Embodiment 1 which lacks filling the tube with a second dielectric material, this embodiment provided 20 slots formed at an interval of about 52.5mm. (See Substitute Specification Page 18, lines 20-22). A comparison of Embodiment 1 and 5 demonstrates an increase in slot density of about 2.5 times based upon the reduction of the slot interval from 52.5 mm to 20 mm. This increase in slot density generates a higher density plasma than that of the prior art references cited.

With regard to the prior art references cited, Suzuki fails to disclose that the interior of the wave guide is filled with a second dielectric material. Inoue and Watanabe both fail to teach or suggest an annular wave guide with a plurality of slots and in turn neither reference teaches or suggests the use of increasing slot density to increase plasma density to remedy the failures of Suzuki as in the present invention.


Even if we presume for the sake of argument that a suggestion to combine Inoue and Watanabe with Suzuki exists, the unexpectedly superior results demonstrated by the present invention rebuts any possible presumption of obviousness.

The objection to claim 110 based on 35 U.S.C. § 101 has been obviated by making the claim depend from claim 109.

In view of the foregoing amendments and remarks, applicants respectfully request entry of the amendment, reconsideration of the claims, and passage to issue of the claims.

Applicant's undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,



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VERSION SHOWING CHANGES MADE TO THE SPECIFICATION

The paragraph starting on page 36, line 15 and ending on page 36, line 19
has been amended as follows.

- -The film forming rate of the silicon nitride film was as large as 500
nm/min, and the film proved to be excellent in quality, showing a refractive index of 2.2
and having satisfactory adhesion and durability. Also it showed a density of 2.9 g/cm^3 ,
denser than in a case without the filling with the second dielectric material 704. - -

VERSION SHOWING CHANGES MADE TO THE CLAIMS

68. (Twice Amended) A microwave plasma processing apparatus comprising:

- a plasma generation chamber provided with a first dielectric material;
- a substrate support for a substrate to be processed, located inside the plasma generation chamber;
- an endless annular wave guide with a plurality of slots for radiating microwaves therethrough provided outside of said first dielectric material;
- gas inputs situated to introduce gas into said plasma generation chamber;
- an evacuation system situated to permit pressure reduction in said plasma generation chamber;
- wherein an interior of said wave guide is filled with a second dielectric material which is the same as or different from said first dielectric material so that the wavelength of microwaves in said wave guide is shortened.[.]

78. (Twice Amended) A microwave plasma processing method wherein a substrate is placed in a microwave plasma processing apparatus comprising a plasma generation chamber provided with a first dielectric material; means for supporting a substrate to be processed; microwave introduction means utilizing an endless annular wave guide provided outside of said plasma generation chamber and provided with plural slots

for irradiating microwaves therethrough; means for introducing gas for said plasma generation chamber; and evacuation means for said plasma generation chamber, wherein the interior of said wave guide is filled with a second dielectric material which is the same as or different from the first dielectric material, so that the wavelength of microwaves in said wave guide is shortened, thereby effecting a plasma process.

110. (Amended) A microwave plasma processing method according to claim [108] 109, wherein adjacent slots of said plurality of slots are at a spacing of one half or one quarter of a guide wavelength of microwaves in said annular waveguide.